IV&V in NASA

Pre-Solicitation Conference/
Industry Day

NASA IV&V FACILITY
July 28, 2004

Purpose of Presentation

- NASA IV&V has been through significant change in the last year, and several key changes remain to be implemented
- The purpose of this presentation is to describe the recent changes and provide some insight into the changes expected in the future

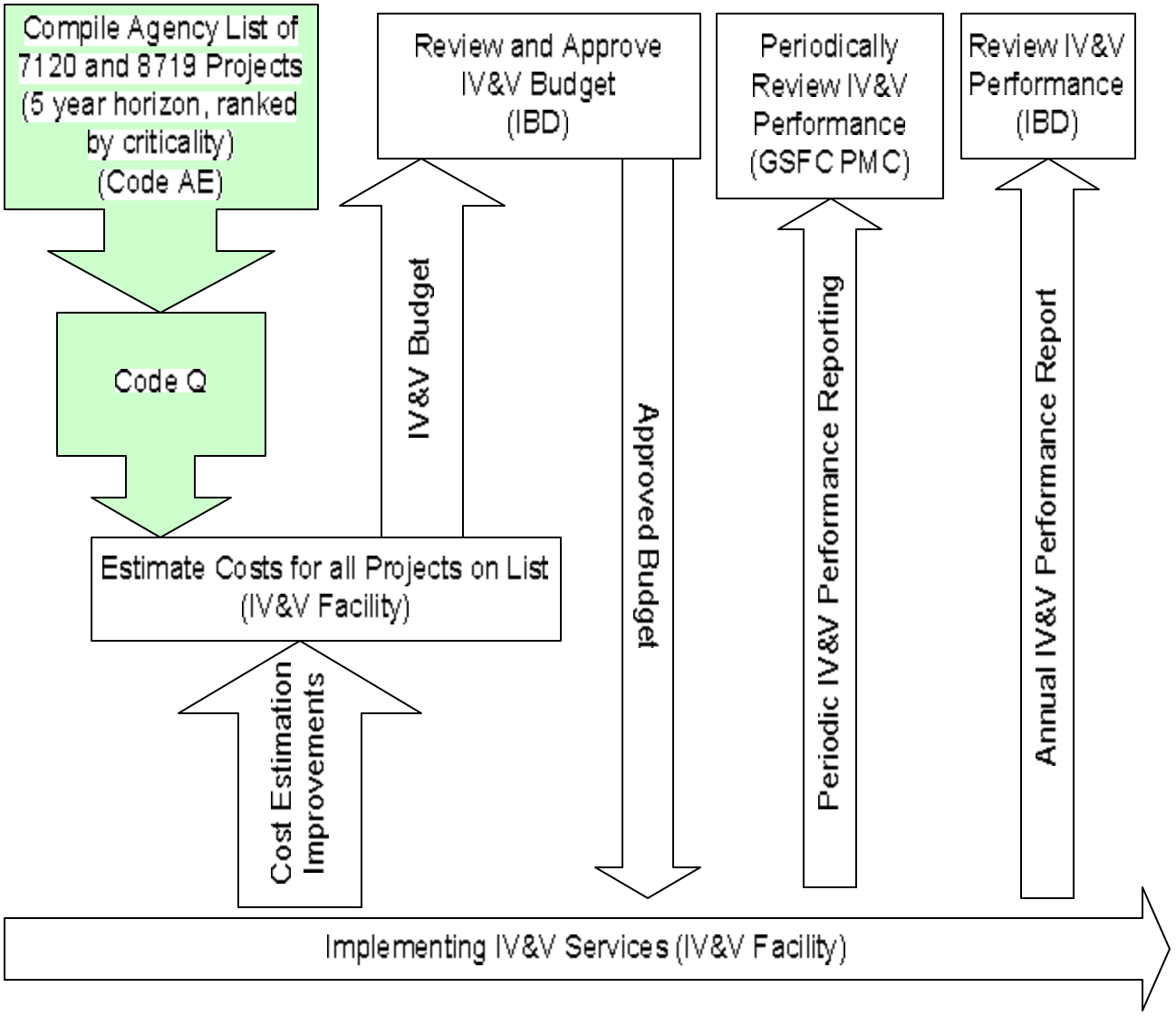
Summary of Changes

- Transition of NASA IV&V to an Program within the Office of Safety and Mission Assurance complete
- Transition IV&V from Project-funded efforts to Agency G&A-funded efforts complete
- Implementation of a standardized description of IV&V tasks (WBS) in-process
  - Standardized Software Integrity Level scheme and tool
  - Use of WBS for task orders, IV&V plans, reporting
- IV&V Liaison at each Center in-process
- Performance measures in-process
- CMMI in-process
- Use of multi-award IDIQ Contract in-process
  - Separate Planning and Scoping Contractor

Background

- In February 2003, the NASA Associate Deputy Administrator for Technology Programs requested Code Q to lead a team to assess the Agency's IV&V capability
  - The assessment team was made up of personnel from HQ, GSFC, JPL, KSC, and DCMA
  - The assessment was conducted during the months of February and March 2003
  - The goals of the assessment were the following:
    - to better understand IV&V's potential
    - to help shape IV&V's continued role at NASA
    - to determine how best to structure the reporting and support of the IV&V Facility to assure its technical, managerial and financial independence
  - The team reviewed IV&V's processes and products. The assessment included interviews with both IV&V customers and with IV&V management.
  - The final assessment team report was published on April 23, 2003
  - The conclusions and recommendations of the assessment team were briefed to the NASA Associate Deputy Administrator for Technology Programs, the NASA Chief Engineer, the Associate Administrator for Safety and Mission Assurance, and the Director of the IV&V Facility on April 4, 2003. At the conclusion of this briefing, the Director of the IV&V Facility was directed to evaluate the assessment team's conclusions and recommendations and prepare a transition plan for implementation of agreed to changes based on the assessment team's report.
- On May 13, 2003, the NASA Executive Council was briefed on the results of the assessment and the recommended IV&V management and funding changes
- During this meeting, and in September of 2003, the Executive Council decided that IV&V would become a Code Q Program delegated to GSFC, an IV&V Board of Directors (IBD) would be formed, IV&V would be funded from Corporate G&A, and measures to improve the effectiveness of IV&V would be put in place

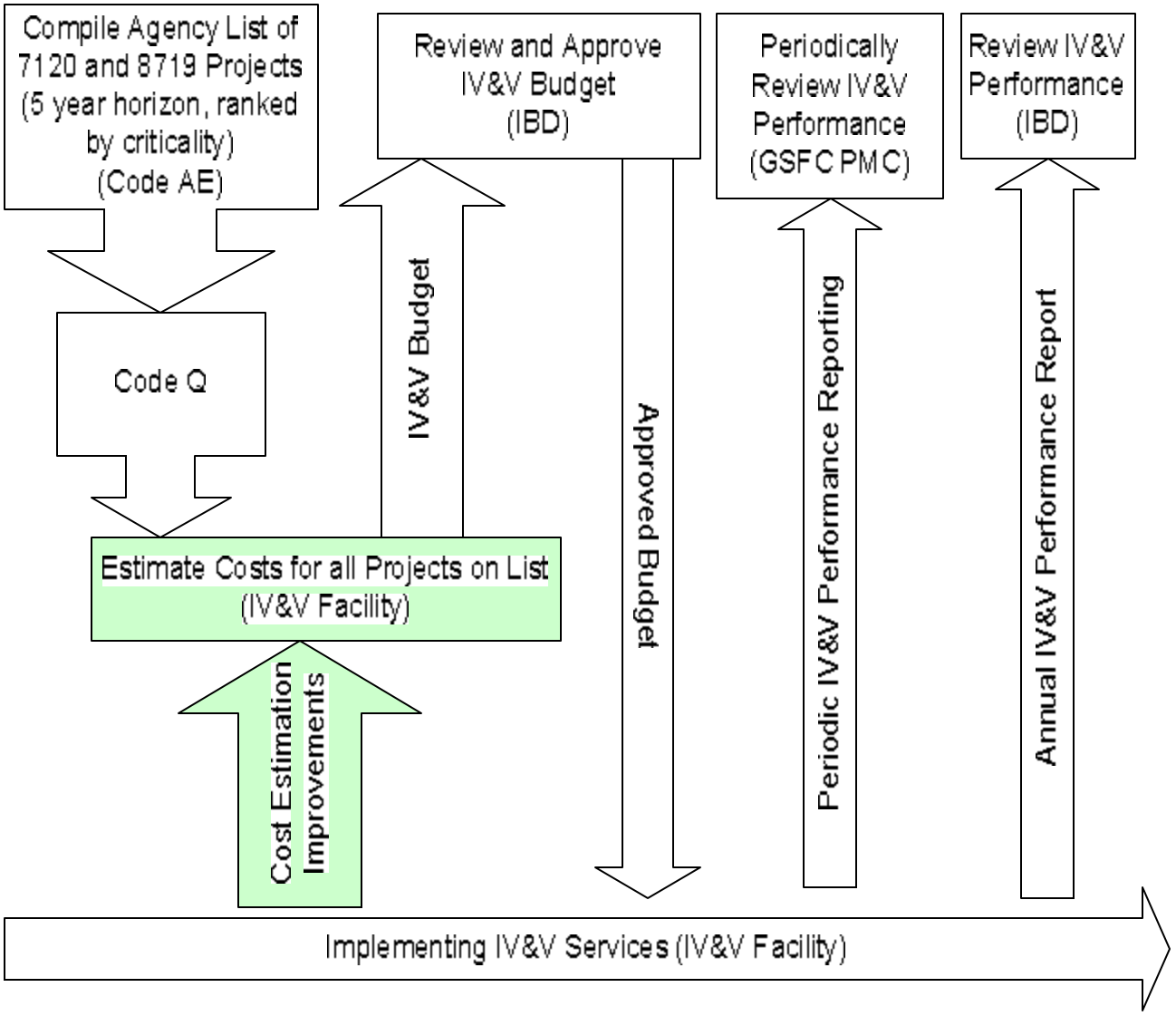
Overall IV&V Process



Ranked List of Projects Based on Criticality of Software

- Process owned by Code AE
- Use the knowledge base of Headquarters and Centers to compile a list of Projects with software under development or maintenance governed by NPG 7120.5 or 8719
  - Objective is to cover a five year horizon
  - Projects are ranked using an Agency-wide criticality criteria
    - Projects are divided into four major classes – Human Rated (H), Robotic (R), Instruments (I), and Information or Data Analysis systems (D)
    - Each project is given a score based on the characteristics of the project. Engineering notes can provide mitigations to the score or ranking.

Scoping and Costing IV&V

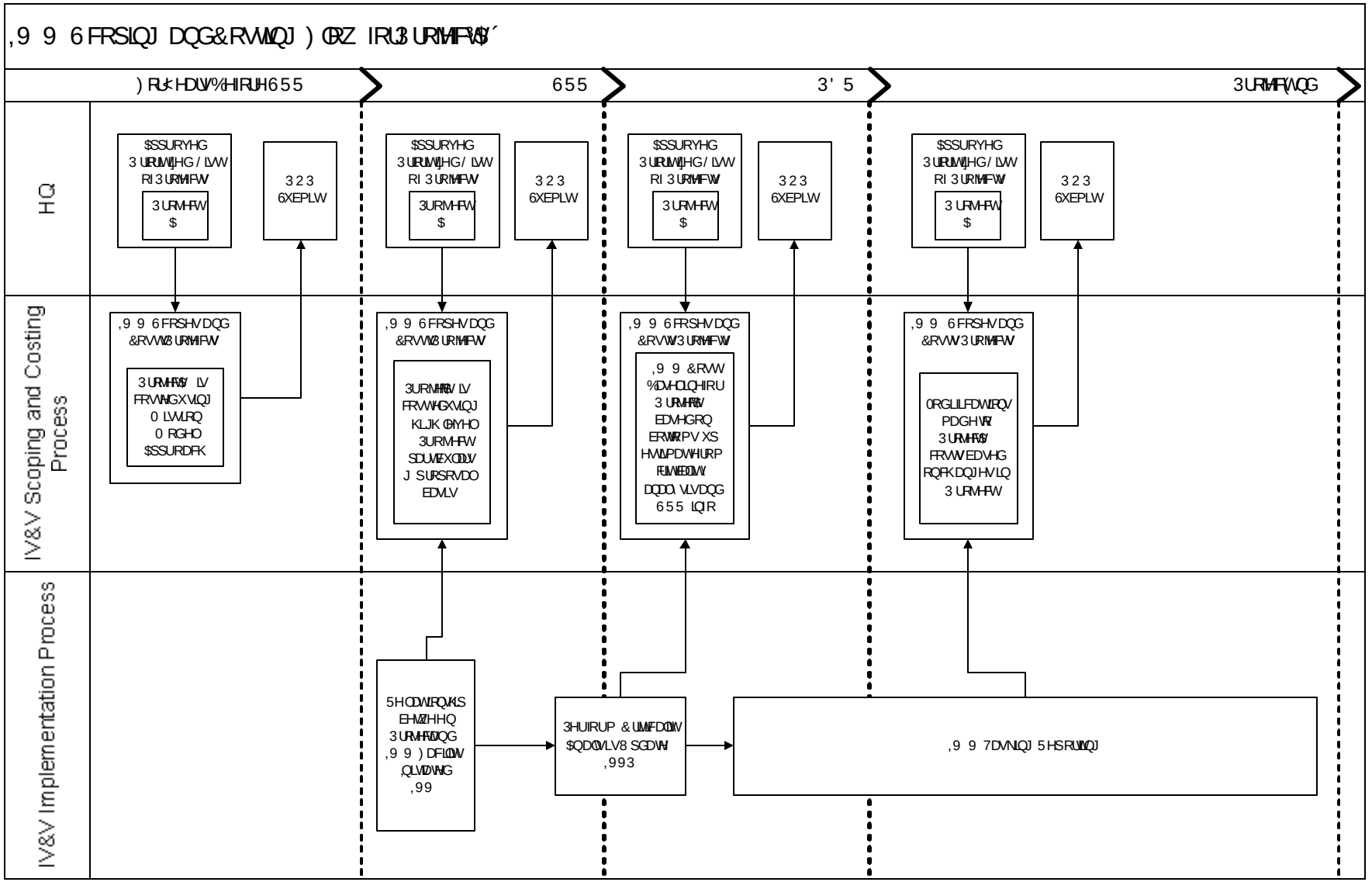


Scoping and Costing IV&V

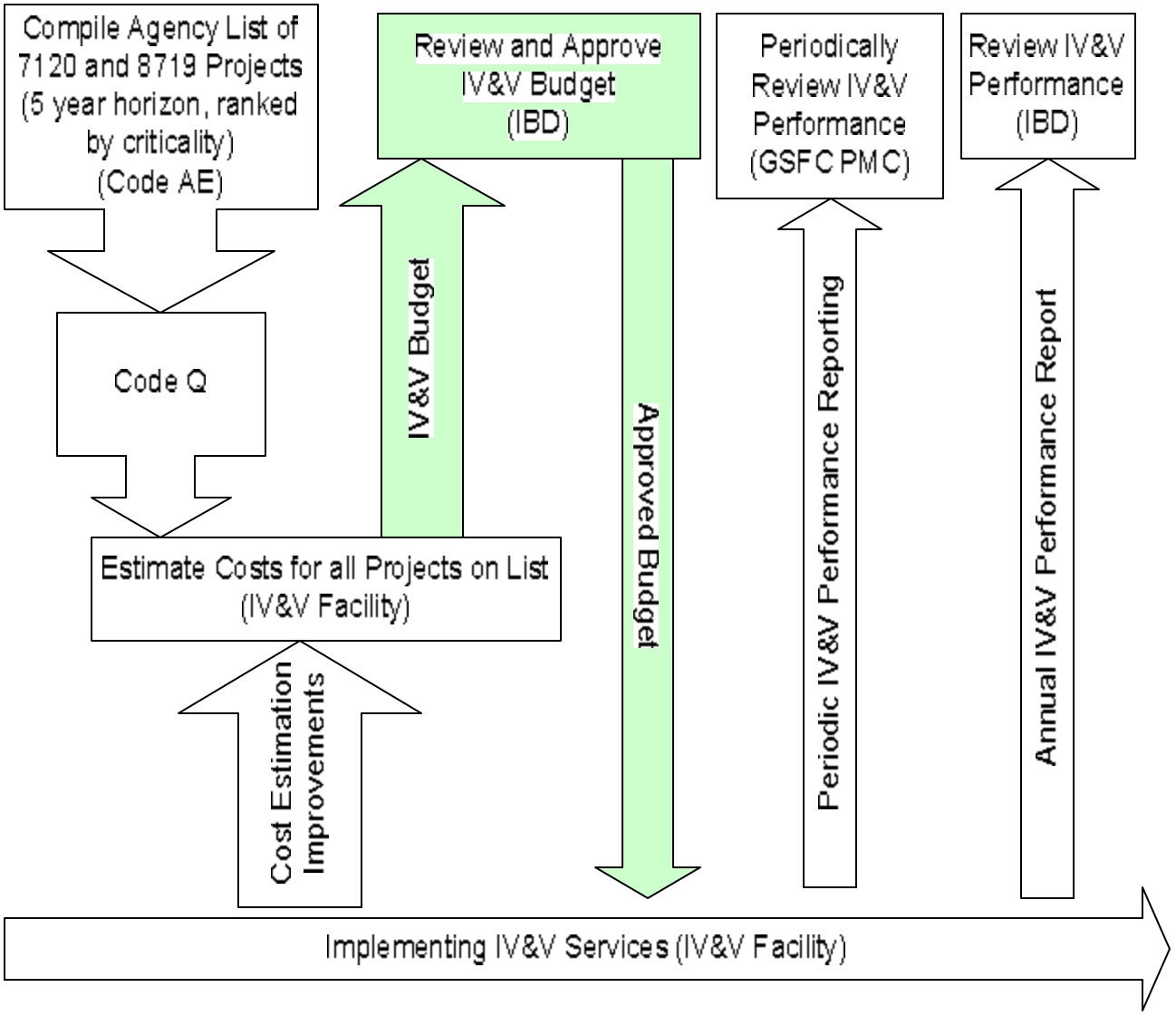
- Purpose is to provide the IV&V Board of Directors (IBD) with a life-cycle IV&V cost estimate for each candidate project
- The IV&V Facility determines the proper level of IV&V support to be applied to each of the projects and generates a cost estimate for each project on the Agency ranked list
- Different cost estimation techniques are used depending upon amount of project detail known (schedule, software size, etc.)
- Data is collected to improve the various cost estimation techniques

Scoping and Costing IV&V

IV&V Facility



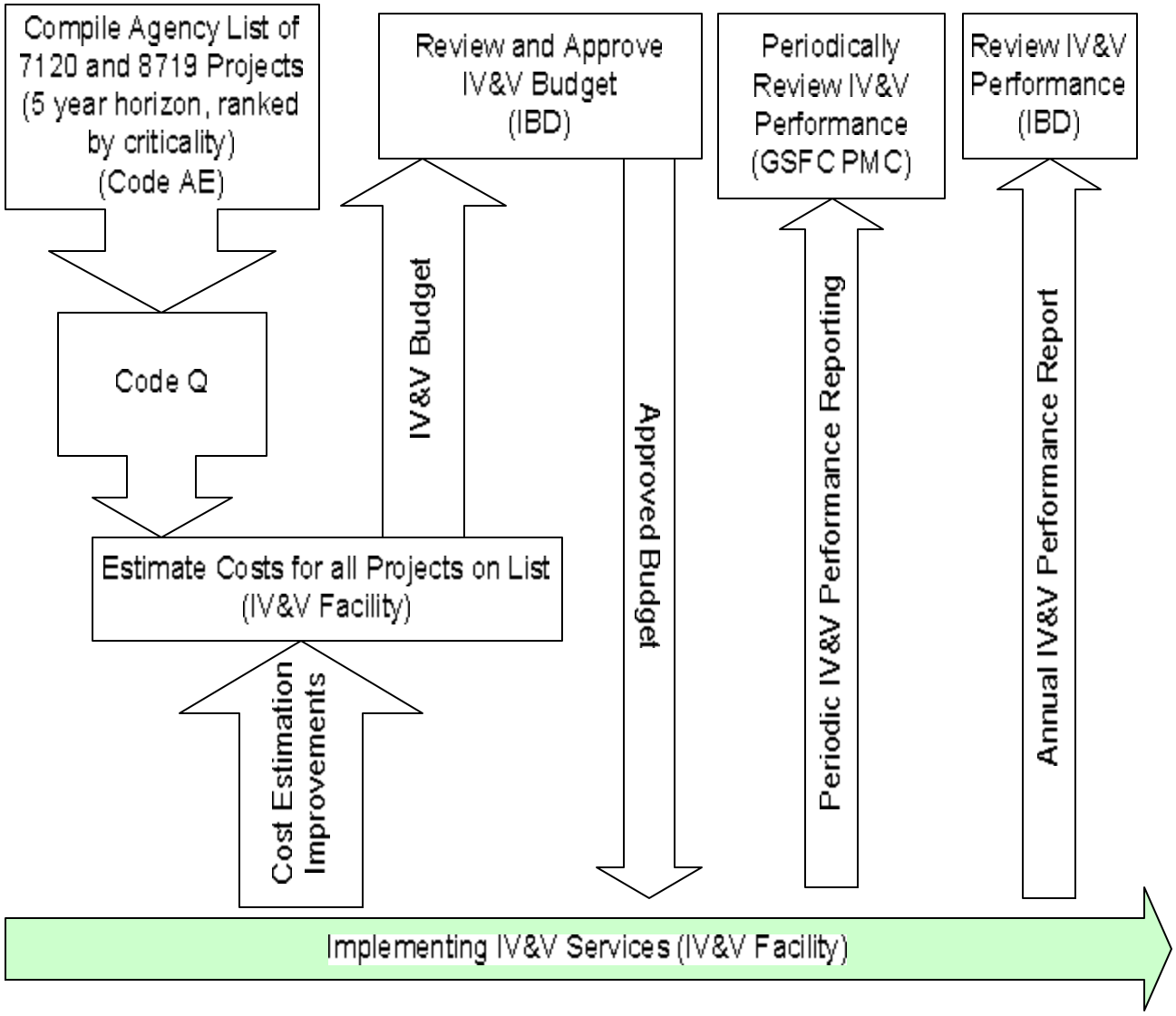
IV&V Budget Review Process



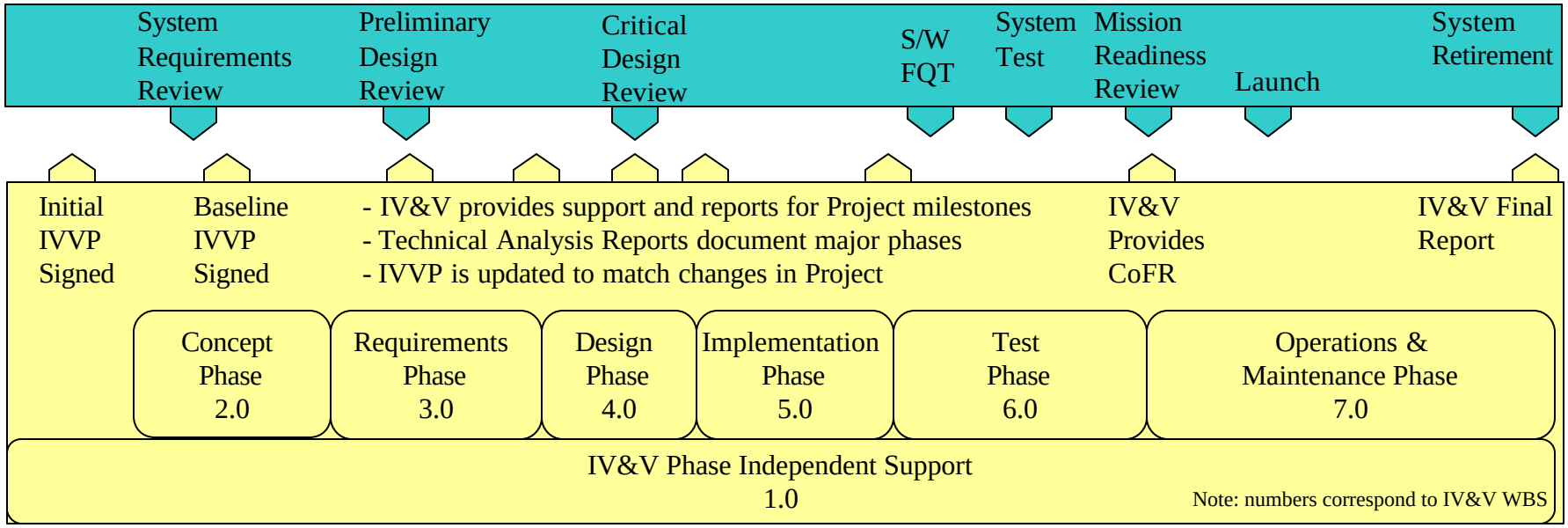
IV&V Budget Review and Approval Process

- IBD is chaired by AA/OSMA and has the Chief Engineer, the CIO, and the AAs for each Enterprise as voting members. GSFC Center Director and IV&V Facility Director are ex officio members
- The IBD determines the appropriate level of funding for software IV&V and selects the Programs and Projects that require support from the IV&V Facility
- It is the intent of the IBD to apply the proper level of IV&V on Programs and Projects that have the most critical software development
- Lower priority Projects, which cannot be supported within the IBD established budget, will not receive IV&V from Corporate G&A
- IBD annually recommends 5 year IV&V budget to Code Q

IV&V Services and Integration with the Project Life Cycle



IV&V and the Project Life-Cycle



- Life-cycle IV&V is designed to mesh with the Project schedule and provide timely inputs to mitigate risk
- Dialog between the IV&V Facility and the Project must begin before SRR
- For most Projects, IV&V ends (and the Final Report is delivered) on or about MRR. Some Projects have extended S/W development post-launch or major upgrades/maintenance (e.g. Shuttle, MER)

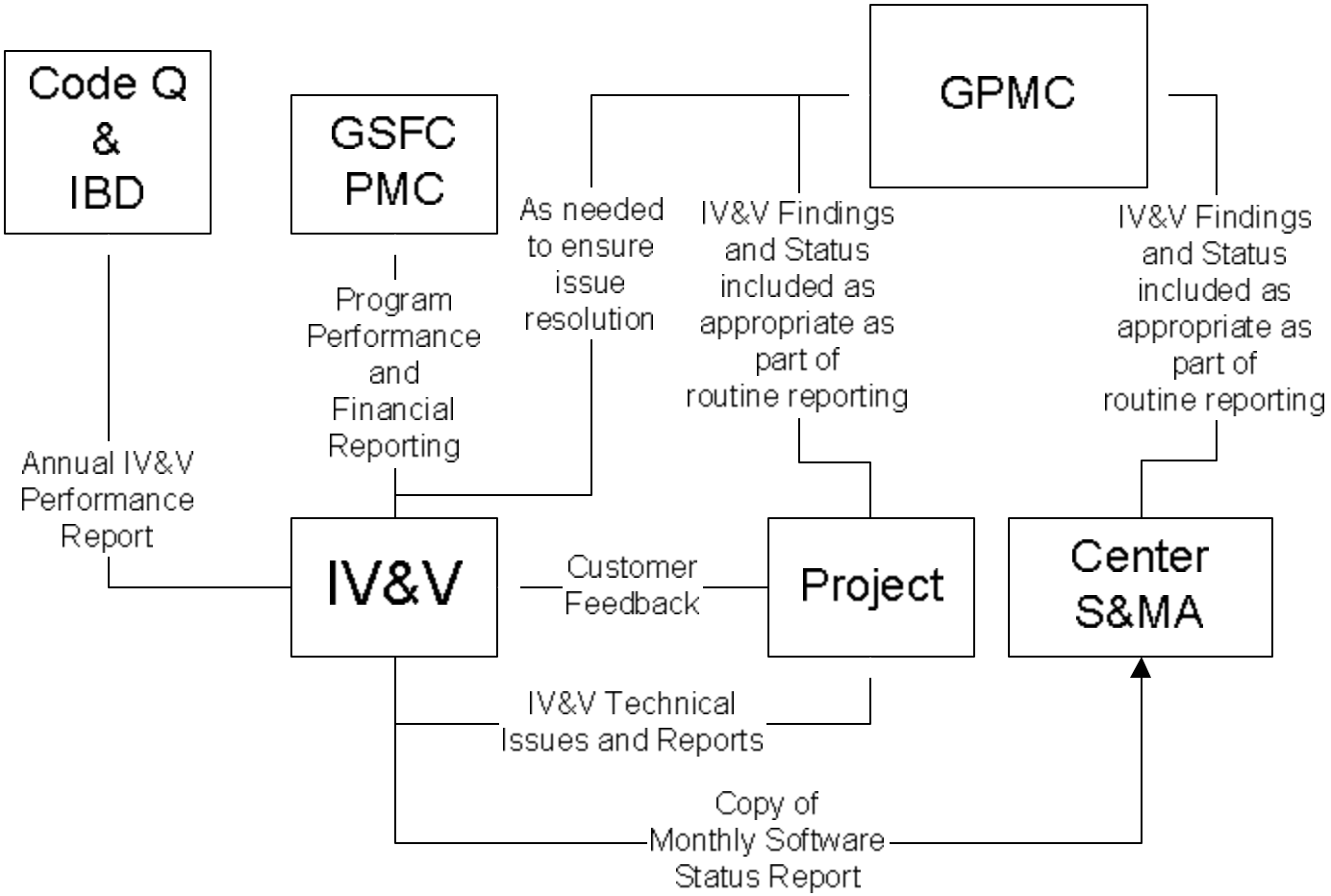
IV&V Facility Relationship to HQ

- IV&V reports annual performance and receives approved budget from IBD (Chaired by Code Q)
- IV&V Program Authority defined in various Agency documentation
  - AA/OSMA delegates Program to GSFC Center Director
  - IV&V Facility Director is Program Manager
- Facility works with Code Q IV&V Liaison to coordinate IBD budget inputs and performance reporting

IV&V/Center/Project Relationships

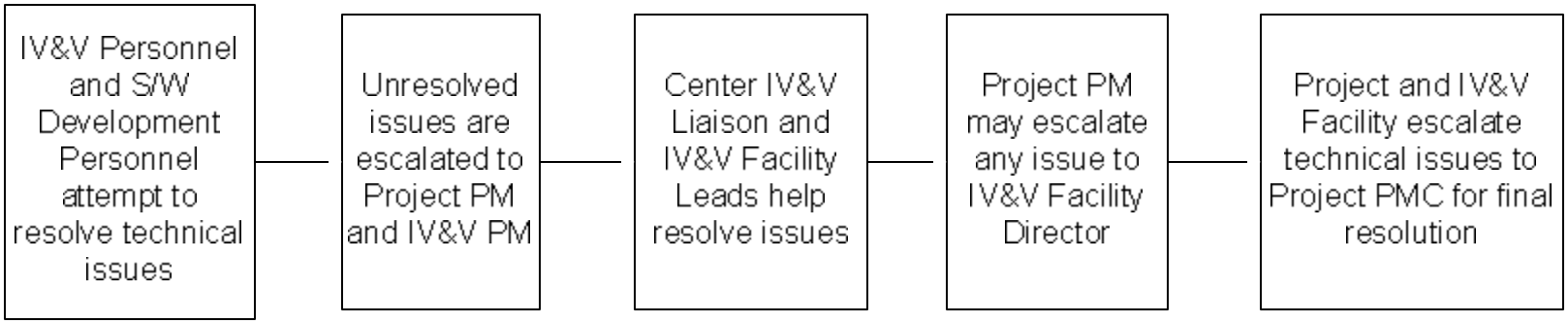
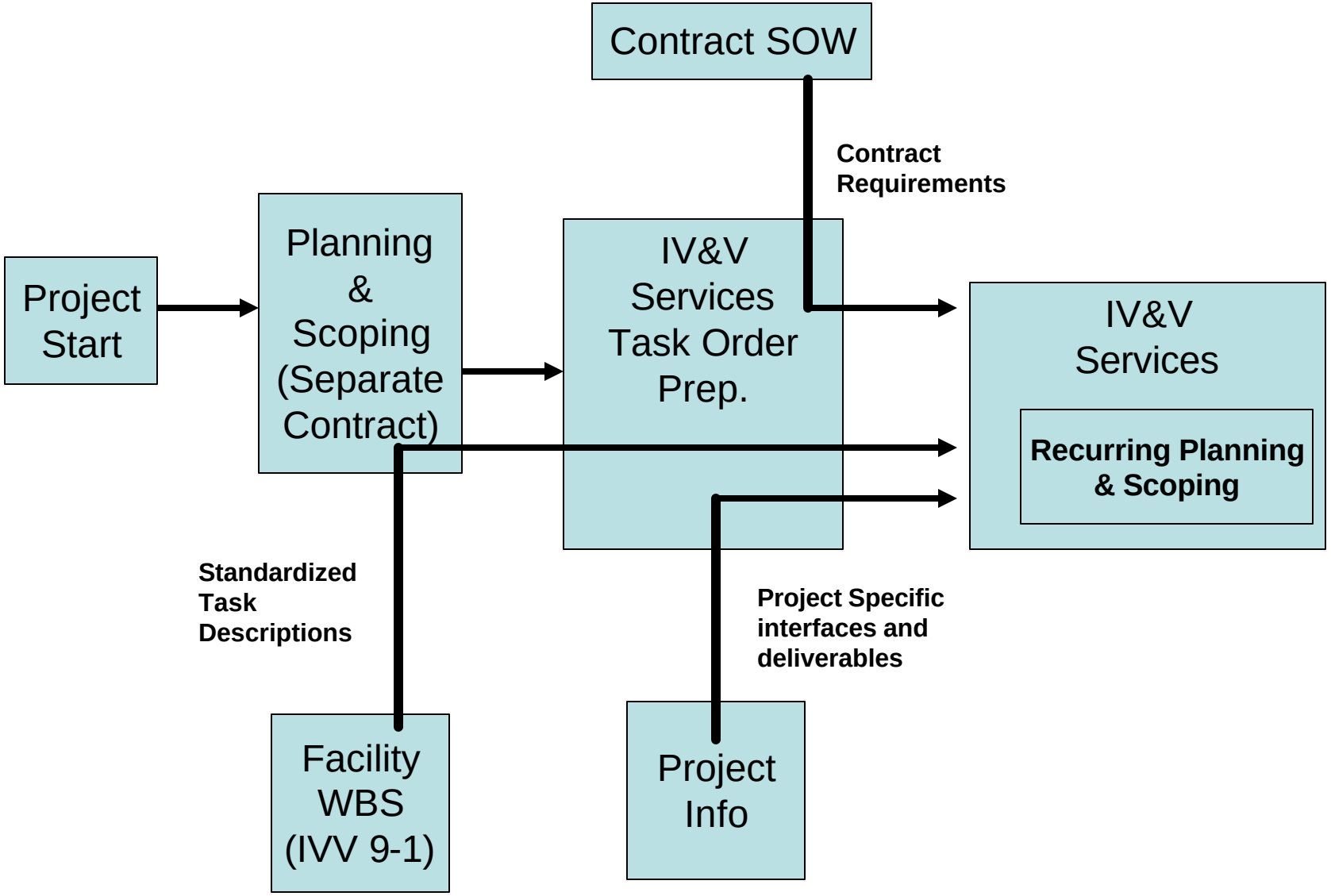
- IV&V-Project Relationship:
  - IV&V still reports issues to Project first and treats Project as primary “customer” for technical findings and risks
  - As a Code Q Program, IV&V will keep Center S&MA personnel informed of IV&V technical issues so that S&MA has a complete mission assurance picture
- IV&V-Center Relationship:
  - Center Liaison facilitates the startup of IV&V on new projects
  - Center Liaison and IV&V Facility Leads facilitate technical issue resolution
  - Center Liaison promotes consistent approaches to IV&V on Projects, and promotes awareness of IV&V Center-wide
  - S&MA, Projects, and IV&V provide technical status and issues to the GPMC
- IV&V reports to GSFC PMC as a Program Office

IV&V Reporting Approach



Note – Other channels of communication can be instituted on a Center-by Center basis as needed or required

Center-level IV&V Issue Escalation Process



Planning and Scoping